




ORIGINAL ARTICLE

Risk perception, treatment adherence, and personality during COVID-19 pandemic: An international study on cancer patients

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Abstract

Objective: To explore the role of personality traits in moderating the relation between COVID-19 risk perception and treatment adherence, and between risk perception and psychosocial distress in patients diagnosed with cancer.

Methods: An online survey ($n = 1281$) was conducted worldwide in seven countries (Austria, Germany, Hong Kong, Italy, Spain, Sweden, and Turkey). Inclusion criteria were to be 18 years of age or older, have received a cancer diagnosis, and be in treatment or follow-up. A few moderated regression models were performed with both personality traits and Hierarchical Taxonomy of Psychopathology super-spectra as moderators.

Results: Detachment, negative affectivity, psychoticism and all the super-spectra significantly moderated the relation between coronavirus risk perception and psychosocial distress, after the adjusting effect of confidence in safeguards. Only

negative affectivity moderated the association between coronavirus risk perception and treatment adherence.

Conclusions: Personality traits may foster the understanding of how a patient might adjust to cancer treatment and, more generically, to highly stressful events such as the COVID-19 pandemic. Further research is needed to confirm the results in different cancer stages and types.

KEYWORDS

alternative model of personality disorders, AMPD, cancer, COVID-19, hierarchical taxonomy of psychopathology, HiTOP, personality, psycho-oncology, traits, treatment adherence

1 | INTRODUCTION

The novel COVID-19 outbreak has dramatically impacted world healthcare systems. Patients diagnosed with cancer are at risk of being more vulnerable to severe events¹ and suffering more from limited access to healthcare services.² Several studies describe a detrimental effect of the pandemic in terms of delay, reduction or cancellation of scheduled treatment, diagnosis, or general health service.^{3,4} This unexpected disruption of cancer care is one of the factors that influence the level of distress of patients,⁵ and collective concerns and risk perception that recurs in the general population.⁶

Little is known about the psychosocial factors that may moderate or mediate in cancer patients the exposure to and so the adjustment to COVID-19, in terms both of distress and treatment adherence.⁷ This limited amount of evidence seems to be explained not only by the novelty of the pandemic, but also by the heterogeneity of psychosocial factors that are recognized as affecting adherence and of which we have no robust evidence in this unexpected context. Indeed, adherence is a multidimensional phenomenon influenced by factors such as patient-related, therapy-related, condition-related, health system, and socio-economic factors.⁸⁻¹⁰ As constructs that are supposed to integrate several bio-psycho-social factors, personality traits may foster the understanding of adjustment to complex diseases such as cancer.¹¹

This study focuses on the role of personality traits in adherence to cancer treatment and in psychosocial distress during the pandemic. Personality traits can be conceptualized as a set of psychosocial factors considered broad cognitive, emotional and impersonal patterns.¹² Personality traits contribute to various mental, medical, and other important life outcomes, and provide a foundational base to modern approaches to psychopathology.¹³ Personality traits might explain phenomena such as treatment adherence better than narrower psychological mechanisms.¹¹ Moreover, modern approaches to psychopathology, such as the Hierarchical Taxonomy of Psychopathology (HiTOP),¹⁴ seemingly confirmed the existence of superordinate spectra of psychopathology that, in turn, align closely with the five domains of the *Diagnostic and Statistical Manual of Mental Disorders—Fifth Edition* (DSM-5) Alternative Model of Personality Disorders (AMPD)¹⁵ and the Big Five of personality.¹⁶ Thus, it is important to examine how these models might predict and explain

human behavior under stressful events such as the combination of cancer care and the COVID-19 pandemic.

Existing systematic reviews suggest that personality is not associated with cancer incidence and mortality,¹⁷ but may be considered a predictor of adjustment to and even adherence to cancer treatment.^{11,18} A few recent cross-sectional studies support the hypothesis that specific personality traits are associated with specific psychosocial responses to COVID-19 in the general population.^{19,20}

The current multi-national cross-sectional study aimed to test the hypothesis that personality traits, as defined by dimensional models such as AMPD, may moderate the relationship between COVID-19 risk perception and treatment adherence, and between risk perception and psychosocial distress in patients diagnosed with cancer. A dimensional approach was supposed to enable a focus on the level of mal/adaptiveness rather than psychopathological categories or thresholds.

2 | METHODS

2.1 | Sample

The first and last author reached out to key representatives of seven countries (Austria, Germany, Hong Kong, Italy, Spain, Sweden, and Turkey) who were invited to join this study. The national representatives, in turn, recruited patients through cancer departments who were asked to disseminate the questionnaire. Except for Hong Kong, whose questionnaires were distributed in person due to context-specific reasons, the survey was disseminated entirely online to overcome the diverse and constantly changing COVID-19 restrictions.

One-thousand-two-hundred-eighty-one participants started to fill the questionnaires. Out of these 968 (76%) completed all the relevant measures. Table 1 present the sociodemographic and medical data.

2.2 | Measures

Personality Inventory for DSM-5, Brief Form: The Personality Inventory for DSM-5, Brief Form (PID-5-BF) is based on the AMPD proposed in

TABLE 1 Socio-demographic and medical data

Age (years) mean \pm SD	53.78 \pm 13.36
range	19–85
Gender <i>n</i> (%)	
Male	329 (34%)
Female	635 (66%)
Country <i>n</i> (%)	
Hong Kong	242 (25%)
Austria	226 (23%)
Germany	140 (14.5%)
Turkey	99 (10%)
Sweden	96 (10%)
Italy	83 (9%)
Spain	82 (8%)
Cancer diagnosis <i>n</i> (%)	
Breast	402 (41.5%)
Stomach/bowl	102 (10.5%)
Prostate	80 (8%)
Lung	60 (6%)
Hematological (leukemia, lymphoma)	38 (4%)
Gynecological	32 (3%)
Testicles	31 (3%)
Other	241 (25%)
Recurrence <i>n</i> (%)	162 (17%)
Currently under treatment	500 (52%)

Note: Two participants did not state their gender; the total number of treatments is above 100% since some participants received a combination of treatments.

section III of the DSM-5²¹ to assess personality traits. It comprises 25 items on a 4-point Likert-Type scale. The items can be divided into five subscales referring to the domains of personality pathology²²: negative affectivity, detachment, antagonism, disinhibition, and psychoticism. In the current study the internal reliability values (McDonald's Omega²³) were 0.795, 0.76, 0.63, 0.72, and 0.77, respectively.

The Coronavirus Risk Perception: This scale, developed by Kanovsky and Halamová,²⁴ is an eight-item measure on a five-point Likert type scale assessing the perceived risk perception during COVID-19. In 2020 it was used in international multilingual studies.²⁵ The internal reliability of the scale (McDonald's Omega) in the current study was 0.765.

Confidence in Coronavirus Safeguards: This 10-item measure (on a five-point Likert type scale) assesses the confidence in the country safeguards during COVID-19.²⁴ During the pandemic it was used in international multilingual studies.²⁵ The internal reliability of the scale (McDonald's Omega) in the current study was 0.81.

Depression, Anxiety, Stress Scale-21: This measure aims to assess symptomatology through three single scales and a total score.²⁶ The

questionnaire comprises 21 items, each on a four-point Likert type scale. For the current study we used only the total score. The internal reliability of the scale (McDonald's Omega) in the current study was 0.95.

Cancer Treatment Non-Adherence during COVID-19: This measure was specifically outlined for the current study and comprised eight items. The questionnaire was created through a standard grounded theory approach: (i) one focus group ($n = 7$) with cancer patients and one focus group ($n = 4$) with experts in psycho-oncology; (ii) development of a first version of the questionnaire by all the authors; and (iii) preliminary evaluation of the questionnaire in two focus groups of cancer patients ($n = 13$). The selected items referred to adherence to cancer treatment and were as general as possible to cover all possibilities through items such as (see Appendix S1): "Since the beginning of the Coronavirus emergency, I have tried to avoid going to the hospital."; "I don't care about skipping a scheduled appointment due to the Coronavirus emergency."; "Due to Coronavirus emergency I did not have received the supportive care as usual." A multilingual version of the questionnaire was created using standard procedure: a linguistic validation through forward and backward translation was performed by the research teams of the countries involved. We used several measures as recommended by Hancock and An²⁷ to confirm a single factor structure for the entire sample: (i) the scree plot visually supported a unifactorial structure; (ii) the Very Simple Structure Criterion (VSSC) suggested 1 factor with complexity score of 0.78 (maximum VSSC complexity = 0.78); (iii) Velicer's Minimum Average Partial supported one factor (based on the minimum value of 0.057); (iv) Root Mean Squared Residuals of a single factor model was sufficiently low (0.19) and did not change much in the transition to two factors structures ($\Delta = 0.14$); and (v) the internal reliability of the scale as measured by McDonald's Omega was found adequate (Maximum Likelihood estimation, McDonald's Omega = 0.75) and confirmed a unifactorial structure. Thus, a total score was created by summing all the items with higher values indicating lower levels of treatment adherence.

2.3 | Procedures

A first institutional review board (IRB) approval was released by Tages Charity (03-2020/23042). IRB approvals were then obtained by the Principal Investigators of all the 7 countries involved through their affiliated institutions. After receiving the IRB approvals all the materials were uploaded to the Qualtrics^{XM} platform and then distributed. The participants had to confirm that they are over 18 years old and sign an informed consent form. Data were collected from June 2020 until November 2020.

2.4 | Missing data

We inspected all study variables (items of the scales of risk perception, confidence in safeguards, non-adherence, Depression, Anxiety, Stress Scale-21, and PID-5-BF) for missing values. The proportion of

missing values ranged from 8% (risk perception items) to 15% (PID-5-BF items). Little's Missing Completely at Random (MCAR) test²⁸ indicated that the data could be considered as MCAR, $\chi^2(1896) = 1595.67, p = 1$. Pearson correlations levels calculated between gender, age, recurrence and missingness (defining as listwise missing data for all variables) were less than 0.2, also supporting an MCAR pattern hypothesis. Based on these findings we decided on a conservative approach and used the listwise deletion of missing data (an approach enabled by the large data set).

2.5 | Statistical analysis

The research aim was to investigate the role of personality in adjusting to COVID-19, or more specifically to estimate how personality traits might moderate the relations between coronavirus risk perception and non-adherence or distress. The research focused on relatively stable variables (personality traits) and, specifically, on the relations between variables (rather than on levels of variables). This focus enabled a combination of the data from all countries under a unified model of moderation analyses. Nevertheless, we opted for a conservative approach and we pre-examined the effect of country and time on our dataset. The time frame was divided into two levels: June, July and August 2020 (the number of new cases was decreasing or low in most of the participating countries); and September, October, and November 2020 (the number of new cases was increasing or high in most of the participating countries).²⁹

Hierarchical linear model analysis was performed to check the significant contribution of a two-level model versus a one-level model (i.e., ignoring the country level and the time frame). We estimated two null models: one for the total adherence score; and one for the total distress scores. These models included the country as random effect and time as fixed effect and total distress and non-adherence scores as dependent variables in each of the model. The model was tested with SPSS's Linear Mixed Models procedure, with a restricted maximum likelihood (REML) estimation. The two-level null model predicting total distress suggested a non-significant country variation (Wald $z = 1.39, p = 0.31$) and a non-significant time effect, $t(3.92) = -0.016, p = 0.988$. Therefore, these levels were not included in the analysis. The two-level null model predicting non-adherence suggested a non-significant country variation (Wald $z = 1.35, p = 0.18$) and a non-significant time effect, $t(3.92) = -0.95, p = 0.39$. Similarly, these levels were not included in the analysis.

To examine the relationship between the study variables we calculated zero-order Pearson correlations between all the study variables. Then, we performed moderation analysis using the Hayes³⁰ PROCESS macro. We tested each personality trait as moderating the relations between risk perception and adherence and risk perception and distress (using safeguards perception as a covariate).

Finally, we tested the 3 HiTOP *superspectra*^{14,31,32} (internalizing, externalizing, psychosis) that are supposed to be hierarchically higher dimensions in respect to PID-5-BF traits, and examined each as a

moderator of the relationship between risk perception and non-adherence and risk perception and distress (using safeguards perception as a covariate). The three superspectra were computed by adding the scores of relative lower-level traits (internalizing: negative affect; externalizing: antagonism, disinhibition; psychosis: detachment, psychoticism), and confirming the reliability through McDonald's Omega (internalizing = 0.84; externalizing = 0.77; internalizing = 0.79).

3 | RESULTS

3.1 | Descriptive statistics and correlations

Table 2 reports mean, standard deviation and correlation between the study variables. Higher levels of distress were significantly related to higher levels of risk perception, lower levels of confidence in safeguards and high levels among all the personality traits. High levels of risk perception were significantly related to higher levels of distress, lower levels of confidence in safeguards and higher levels of non-adherence (although the correlation was very small). The personality traits were found to be highly correlated with each other.

3.2 | Traits as moderators of the relationship between risk perception and distress

Personality traits were tested as moderators in a model including risk perception as focal antecedent of distress, and confidence in safeguards as covariate. Results indicated that higher levels of risk perception are associated with higher levels of distress. This effect was moderated in three distinct models by: negative affect, detachment, and psychoticism. Higher levels of each of these traits were related to a stronger relationship between risk perception and distress. Interactions significance tests were reliable: negative affect, R square change = 0.0057, $F(1, 963) = 10.83, p < 0.001$; detachment, R square change = 0.0063, $F(1, 963) = 10.83, p < 0.002$; psychoticism, R square change = 0.009, $F(1, 963) = 13.71, p < 0.0002$.

3.3 | Traits as moderators of the relationship between risk perception and non-adherence

Personality traits were tested as moderators in a model including risk perception as the antecedent of non-adherence, and confidence in safeguards as the covariate. Results indicated that higher levels of risk perception are associated with higher levels of distress. This effect was moderated only by negative affect. Negative affect was related to a weaker relationship between risk perception and non-adherence. Interactions significance test was reliable: R square change = 0.0046, $F(1, 963) = 4.45, p < 0.035$.

TABLE 2 Means, standard deviations, and intercorrelations for the study variables

Variable (possible range)	Mean	SD	Distress	Risk perception	Safeguards' perception	Adherence	Negative affect	Detachment	Antagonism	Disinhibition	Psychoticism
Distress (0–3)	0.74	0.64	1.00	0.35**	-0.20**	0.00	0.67**	0.54**	0.34**	0.32**	0.51**
Risk perception (1–5)	2.98	0.77	0.35**	1.00	-0.27**	0.08*	0.24**	0.12**	-0.02	-0.06	0.08*
Safeguards' perception (1–5)	3.64	0.60	-0.20**	-0.27**	1.00	-0.07*	-0.19**	-0.19**	-0.06	-0.05	-0.15**
Non-adherence (1–5)	3.11	1.16	0.00	0.08*	-0.07*	1.00	0.02	0.05	0.08*	0.08*	0.04
Negative affect (1–4)	1.90	0.70	0.67**	0.24**	-0.19**	0.02	1.00	0.53**	0.44**	0.48**	0.56**
Detachment (1–4)	1.69	0.64	0.54**	0.12**	-0.19**	0.05	0.53**	1.00	0.46**	0.45**	0.59**
Antagonism (1–4)	1.48	0.46	0.34**	-0.02	-0.06	0.08*	0.44**	0.46**	1.00	0.47**	0.57**
Disinhibition (1–4)	1.59	0.53	0.32**	-0.06	-0.05	0.08*	0.48**	0.45**	0.47**	1.00	0.54**
Psychoticism (1–4)	1.55	0.58	0.51**	0.08*	-0.15**	0.04	0.56**	0.59**	0.57**	0.54**	1.00

* $p < 0.05$; ** $p < 0.01$.

3.4 | HiTOP superspectra as moderators

Each of three superspectra was tested as a moderator in a risk perception model as an antecedent of distress and risk perception as antecedent of non-adherence. In all the models confidence in safeguards was included as a covariate. Table 2 and Figure 1 present the psychopathology factors (superspectra) as moderating the relation between risk perception and distress. Each of the three factors was a significant moderator, with higher levels of superspectra related to stronger relation between higher risk perception and higher distress.

Table 3 and Figure 1 present the superspectra as moderating the relationship between risk perception and non-adherence. The only factor that was found to be a significant moderator was internalizing. Higher levels of internalizing were related to decreasing relation between risk perception and non-adherence. In the very high levels of internalizing there was even a tendency towards negative (even significant) relationship between risk perception and non-adherence.

4 | DISCUSSION

The present study aimed at exploring the role of personality traits in moderating the relationship between coronavirus risk perception and treatment adherence or distress in patients diagnosed with cancer. Our results suggest that personality, as defined by dimensional rather than categorical models, may be a useful pattern in understanding how persons adjust to stressful events such as the combination of cancer care and the COVID-19 pandemic.

While numerous psychosocial factors are associated with distress and adherence,^{8–10} research focused on evaluating measures that can offer a general understanding of recurrent and potentially pathological modes of adjustment. A context such as the pandemic associated with a significant risk^{2,3,5,7} of high distress and low adherence can be informative in testing such measures in cancer care. Our results seemingly suggest that the more severe are specific maladaptive traits or HiTOP domains, the greater the relationship between risk perception and psychosocial suffering. Moreover, internalizing superspectrum resulted a negative moderator of the relationship between risk perception and non-adherence: the higher the superspectrum, the lower the association between risk perception and adherence, potentially exposing patients to a distorted decision-making process. To our knowledge, this is the first study using HiTOP in cancer care.

Beyond the limitations of a cross-sectional study, the results are consistent with a growing body of evidence about statistical and clinical reliability of hierarchical models of psychopathology that, in turn, are rooted in a dimensional approach to personality.^{13,15} Indeed, personality domains refer to broad and recurrent adaptive or maladaptive strategies the persons use to adjust to their experience.³³ Little is known about applying these approaches in cancer care,^{11,17} but the present study seemingly supports the need for further translational research. Consistent with existing results in the field of mental health,³⁴ our study suggests that broad domains may correlate with the severity of psychosocial distress.

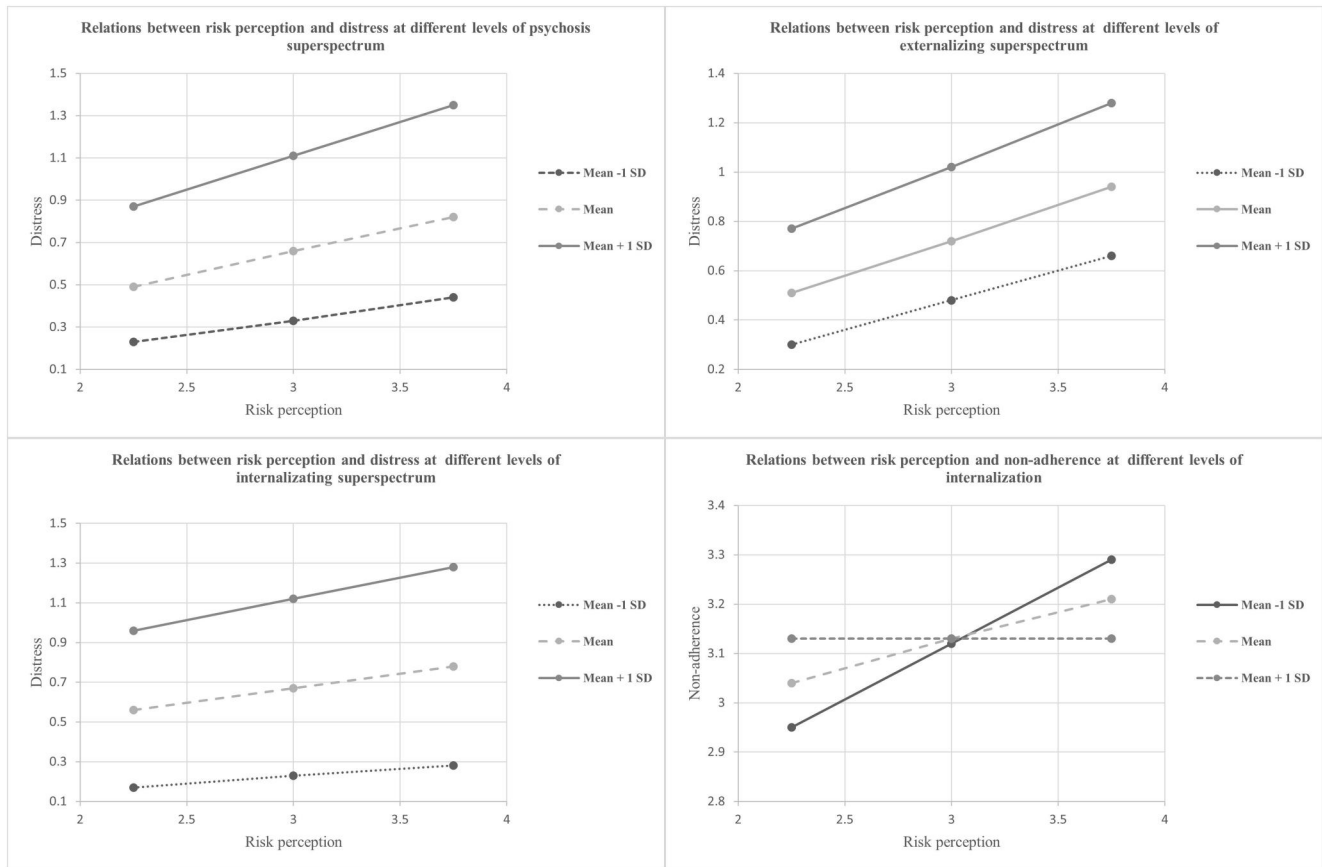


FIGURE 1 Moderated regression models

TABLE 3 Superspectra as moderators

Moderating the relation between risk perception and distress							
Moderators	Model summary			Test of interaction			
	R square	MSE	$F(4, 963) =$	$p <$	R square change	$F(1, 963) =$	$p <$
Internalizing spectrum	0.50	0.21	237.89	0.0001**	0.0057	10.83	0.001**
Externalizing spectrum	0.29	0.29	98.53	0.0034**	0.0034	4.622	0.032*
Psychosis spectrum	0.44	0.23	187.89	0.0001**	0.009	16.195	0.0001**
Moderating the relation between risk perception and non-adherence							
Moderators	Model summary			Test of interaction			
	R square	MSE	$F(4, 963) =$	$p <$	R square change	$F(1, 963) =$	$p <$
Internalizing spectrum	0.014	1.325	3.36	0.0018**	0.0003	0.27	0.035*
Externalizing spectrum	0.018	1.32	4.32	0.0034**	0.00034	4.622	0.6 N.S
Psychosis spectrum	0.012	1.33	2.98	0.0185*	0.0017	1.68	0.1955 N.S

* $p < 0.05$; ** $p < 0.01$.

Finally, two results need to be interpreted separately. First, only the internalizing spectrum emerges as a significant moderator concerning adherence. This result seems consistent with the fact that neuroticism is frequently reported as a robust predictor of several mental and physical disorders³⁵ and a reduced capacity to adjust to

chronic conditions.^{36,37} Second, antagonism and disinhibition individually were not moderators but only as superspectrum (i.e., externalizing). We can assume that it is the interaction between these two traits that affect the relationship between risk perception and distress (rather than them individually).

5 | LIMITATIONS

The main limit of the study is its cross-sectional design and so the potential hidden effect of several confounding variables related to coronavirus rates of infections and death, or specific public health policies and strategies against COVID-19. Such variables might have affected the reported results and so our conclusions might be unreliable. Similarly, the disease progression or pathology of recruited patients may have biased the study. That said, the research was designed to overcome these limitations. First, the statistical analysis plan included a moderation model that is reputed to be scarcely affected by confounding variables. Second, the choice of personality traits as moderators offered an additional advantage as superordinate and broad domains. Third, preliminary REML analysis confirmed that the confounding variables did not influence the moderation model.

Finally, due to the pandemic we could not use physical data to assess adherence, but only a specifically developed questionnaire. This reduces the reliability of our results.

6 | CLINICAL IMPLICATIONS

Our study supports the need for considering personality traits as reliable mechanisms in understanding how a patient might adjust to the complexity of cancer care. As the cultural contexts and COVID-19 infection and mortality rates change, traits could help clinicians better conceptualize patients' distress and adherence. For example, a short personality screening tool such as PID-5-BF could be included in the routine evaluations of patients diagnosed with cancer. Indeed, knowing that a patient's personality refers to the internalizing spectrum could allow clinicians to assess a potentially higher risk in dealing with unstable contexts (e.g., new coronavirus variants; uncertainty about prognosis). Further studies are needed to confirm the reported results and extend our knowledge about the role of personality traits in adjusting to cancer trajectories.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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